

**DOWNHOLE SEAL ELEMENT FORMED FROM  
A NANOCOMPOSITE MATERIAL**

ABSTRACT OF THE DISCLOSURE

A seal element (70) for providing a static or dynamic seal between two components (74, 78) in a downhole tool includes a polymer host material (212) and a plurality of nanostructures (220) forming a nanocomposite material (210). The polymer host material (212) has a plurality of regions of free volume (222) that receive the nanostructures (220). The nanostructures (220) and the polymer host material (212) form interfacial interactions that improve the useful life of the seal element (70) by minimizing seal failures associated with explosive decompression, extrusion, spiral failure, abrasion, temperature degradation and the like.